AMENDMENTS TO THE CLAIMS:

1. (Original) A 3D scanning apparatus configured to image a physical entity, said apparatus comprising:

a radiation projector for projecting a plurality of radiation stripes onto said physical entity;

a detector for detecting said striped radiation received from said physical entity; and

a data storage device for storing said received radiation as a pixellated bitmap image comprising a plurality of rows;

said apparatus characterised in that said physical entity, said radiation projector and said detector are geometrically arranged to constrain the number of times that each said received stripe is permitted to occur in a pixel row of said bitmap, said geometrical constraint determining an occlusion classification comprising a plurality of stored types of occlusions and said apparatus additionally comprising an occlusion type processing means for detecting said types of occlusions in said received image data.

2. (Original) An apparatus according to claim 1, wherein said radiation projector utilises visible wavelength electromagnetic radiation and said detector is configured to detect visible light.

3. (Currently Amended) An apparatus according to claim 1 ~~or claim 2~~, wherein said geometrical constraint restricts said predetermined number of times to once per row.

4. (Currently Amended) An apparatus according to ~~any preceding claim~~ claim 1, wherein said stripes are uniform uncoded stripes.

5. (Currently Amended) An apparatus according to ~~any preceding claim~~ claim 1, wherein:

said physical entity is spatially defined with respect to a Cartesian coordinate frame (X_O, Y_O, Z_O);

said projector has origin O_P in a Cartesian coordinate frame (X_P, Y_P, Z_P); and

said detector has origin O_L in a Cartesian coordinate frame (X_L, Y_L, Z_L),

said geometrical constraint comprising alignment of said projector and said detector such that coordinate axes Z_0, Z_P, Z_L, are substantially parallel and coordinate axes X_0, X_P and X_L are substantially parallel.

6. (Original) An apparatus according to claim 5, wherein said geometrical constraint comprises configuring said coordinate axes Z_0, Z_P, Z_L, X_0, X_P and X_L to all lie in substantially the same plane.

7. (Currently Amended) An apparatus according to claim 5 ~~or claim 6~~, wherein said geometrical constraint additionally comprises positioning said projector so that its origin O_P lies on said X_L axis of said detector.

8. (Currently Amended) An apparatus according to claim 5 ~~or claim 6~~, wherein said geometrical constraint comprises positioning said projector so that its origin O_P lies on said X_L axis of said detector such that said coordinate frame origins O_P and O_L lie on the same plane.

9. (Original) An apparatus according to claim 8, wherein said same plane is inclined at an angle a to axis Z_L.

10. (Original) An apparatus as claimed in claim 8, wherein said projector projects visible light and said detector comprises a video camera having focal length F, said same plane being inclined at an angle a to axis Z_L and said plane being defined in accordance with the equation: $y_B = -F \tan a$ such that a beam projected in said plane is reflected back in the same plane and onto the image plane at row $-F \tan a$.

11. (Currently Amended) An apparatus according to ~~any preceding claim~~ <u>claim 1</u>, wherein said occlusion type processing means is configured to process said obtained image data into an array of peaks of peak pixel data, each said peak substantially representing the centre of a said stripe received by said detector.

12. (Currently Amended) An apparatus according to ~~any preceding claim~~ <u>claim 1</u>, wherein said occlusion type processing means is configured to search said peaks in said array for discontinuities, said processing means being further configured to:

create an occlusion map through identifying and labelling said discontinuities as at least being of a first type or of a second type of discontinuity.

13. (Original) An apparatus according to claim 12, wherein said created occlusion map is used to define boundaries for use by an indexing processing means, said indexing means being configured to index said stripes by using said boundary information and said stored classification.

14. (Original) An apparatus according to claim 13, wherein said indexing processing means is configured to process said peak pixel data in accordance with steps comprising:

(a) selecting a start position in said peak pixel data and initialising a stripe index count for said selected stripe;

(b) tracing the current stripe in a first direction along said stripe until a said first boundary condition is met;

(c) returning to said start position and tracing said current stripe in the opposite direction to said first direction until a said boundary condition is met;

(d) increasing the stripe index and moving to the next stripe in a third direction, said third direction substantially perpendicular to said first and second directions, and repeating steps (b) and (c);

(e) repeating step (d) until a second boundary condition is met; and

(f) returning to said start position and repeating steps (d) and (e), but moving in a fourth direction, said fourth direction being substantially 180° from said third direction, and decreasing said stripe index each time.

15. (Original) An apparatus according to claim 13, wherein said indexing processing means is configured to process said peak pixel data in accordance with a flood fill recursive processing routine.

16. (Currently Amended) An apparatus according to ~~any of claims 13 to 15~~ claim 13, wherein said indexed stripes are used to reconstruct a 3D surface of a scanned physical entity.

17. (Original) In a 3D scanning apparatus configured to In a 3D scanning apparatus configured to image a physical entity, said apparatus comprising a radiation projector for projecting a plurality of radiation stripes onto said physical entity, a detector for detecting said striped radiation received from said physical entity and a data storage device for storing said received radiation as a pixellated bitmap image comprising a plurality of rows, a method of imaging characterised in that:

said physical entity, said radiation projector and said detector are geometrically arranged to constrain the number of times that each said received stripe is permitted to occur in a pixel row of said bitmap, said geometrical constraint determining an occlusion classification comprising a plurality of stored types of occlusions and said apparatus additionally comprising an occlusion type processing means for detecting said types of occlusions in said received image data.

18. (Original) The method according to claim 17, wherein said method utilises visible wavelength electromagnetic radiation.

19. (Currently Amended) The method according to claim 17 ~~or claim 18~~, wherein said geometrical constraint restricts said predetermined number of times to once per row.

20. (Currently Amended) The method according to ~~any of claims 17 to 19~~ claim 17, wherein said stripes are uniform uncoded stripes.

21. (Currently Amended) The method according to ~~any of claims 17 to 20~~ claim 17, wherein:

said physical entity is spatially defined with respect to a Cartesian coordinate frame (X_O, Y_O, Z_O);

said projector has origin O_P in a Cartesian coordinate frame (X_P, Y_P, Z_P); and

said detector has origin O_L in a Cartesian coordinate frame (X_L, Y_L, Z_L),

said geometrical constraint comprising alignment of said projector and said detector such that coordinate axes Z_0, Z_P, Z_L, are substantially parallel and coordinate axes X_0, X_P and X_L are substantially parallel.

22. (Currently Amended) The method according to ~~any of claims 17 to 21~~ claim 17, wherein said geometrical constraint comprises configuring said coordinate axes Z_0, Z_P, Z_L, X_0, X_P and X_L to all lie in substantially the same plane.

23. (Currently Amended) The method according to claim 21 ~~or claim 22~~, wherein said geometrical constraint additionally comprises positioning said projector so that its origin O_P lies on said X_L axis of said detector.

24. (Currently Amended) The method according to claim 21 ~~or claim 22~~, wherein said geometrical constraint comprises positioning said projector so that its origin O_P lies on said X_L axis of said detector such that said coordinate frame origins O_P and O_L lie on the same plane.

25. (Original) The method according to claim 24, wherein said same plane is inclined at an angle a to axis Z_L.

26. (Original) The method according to claim 25, wherein said projector projects visible light and said detector comprises a video camera having focal length F, said same plane being inclined at an angle a to axis Z_L and said plane being defined in accordance with the equation: $y_B = -F \tan a$ such that a beam projected in said plane is reflected back in the same plane and onto the image plane at row $-F \tan a$.

27. (Currently Amended) The method according to ~~any of claims 17 to 26~~ claim 17, wherein said occlusion type processing step processes said obtained image data into an array of peaks of peak pixel data, each said peak substantially representing the centre of a said stripe received by said detector.

28. (Currently Amended) The method according to ~~any of claims 17 to 27~~ claim 17, wherein said occlusion type processing step comprises the steps of:

searching said peaks in said array for discontinuities; and

creating an occlusion map through identifying and labelling said discontinuities as at least being of a first type or of a second type of discontinuity.

29. (Original) The method according to claim 28, wherein said occlusion map is used to define boundaries for use in indexing said stripes, said indexing using said boundary information and said stored classification.

30. (Original) The method according to claim 29, wherein said indexing step is configured to process said peak pixel data in accordance with steps comprising:

(a) selecting a start position in said peak pixel data and initialising a stripe index count for said selected stripe ;

(b) tracing the current stripe in a first direction along said stripe until a said first boundary condition is met;

(c) returning to said start position and tracing said current stripe in the opposite direction to said first direction until a said boundary condition is met;

(d) increasing the stripe index and moving to the next stripe in a third direction, said third direction substantially perpendicular to said first and second directions, and repeating steps (b) and (c);

(e) repeating step (d) until a second boundary condition is met; and

(f) returning to said start position and repeating steps (d) and (e), but moving in a fourth direction, said fourth direction being substantially 180° from said third direction, and decreasing said stripe index each time.

31. (Original) The method according to claim 30, wherein said indexing step comprises processing said peak pixel data in accordance with a flood fill recursive processing routine.

32. (Currently Amended) The method according to ~~any of claims 29 to 31~~ claim 29, wherein said indexed stripes are used to reconstruct a 3D surface of a scanned physical entity.

33. (Original) A 3D scanning apparatus configured to image a physical entity, said apparatus comprising:

a radiation projector for projecting a plurality of radiation stripes onto said physical entity;

a detector for detecting said striped radiation received from said physical entity; and

a data storage device for storing said received radiation as a pixellated bitmap image comprising a plurality of rows;

said apparatus characterised in that said physical entity, said radiation projector and said detector are geometrically arranged to constrain the number of times that each said received stripe is permitted to occur in a pixel row of said bitmap.

34. (Original) In a 3D scanning apparatus configured to In a 3D scanning apparatus configured to image a physical entity, said apparatus comprising a radiation projector for projecting a plurality of radiation stripes onto said physical entity, a detector for detecting said striped radiation received from said physical entity and a data storage device for storing said received radiation as a pixellated bitmap image comprising a plurality of rows, a method of imaging characterised in that:

said physical entity, said radiation projector and said detector are geometrically arranged to constrain the number of times that each said received stripe is permitted to occur in a pixel row of said bitmap.

35. (Original) A 3D scanning apparatus configured to image a physical entity, said apparatus comprising:

a radiation projector for projecting a plurality of radiation stripes onto said physical entity;

a detector for detecting said striped radiation received from said physical entity; and

a data storage device for storing said received radiation as a pixellated bitmap image;

said apparatus characterised in that said physical entity, said radiation projector and said detector are geometrically arranged so that each said received stripe is permitted to occur only once in a given pixel row of said bitmap.

36. (Original) A 3D scanning apparatus configured to image a physical entity, said apparatus comprising:

a radiation projector for projecting radiation onto said physical entity;

a detector for detecting said striped radiation received from said physical entity; and

a data storage device for storing said received radiation as a pixellated bitmap image;

said apparatus configured in accordance with the predefined geometrical arrangement, wherein:

said predefined geometrical arrangement comprises a constraint such that each said received stripe can only occur a predetermined number of times in a pixel row of said bitmap.